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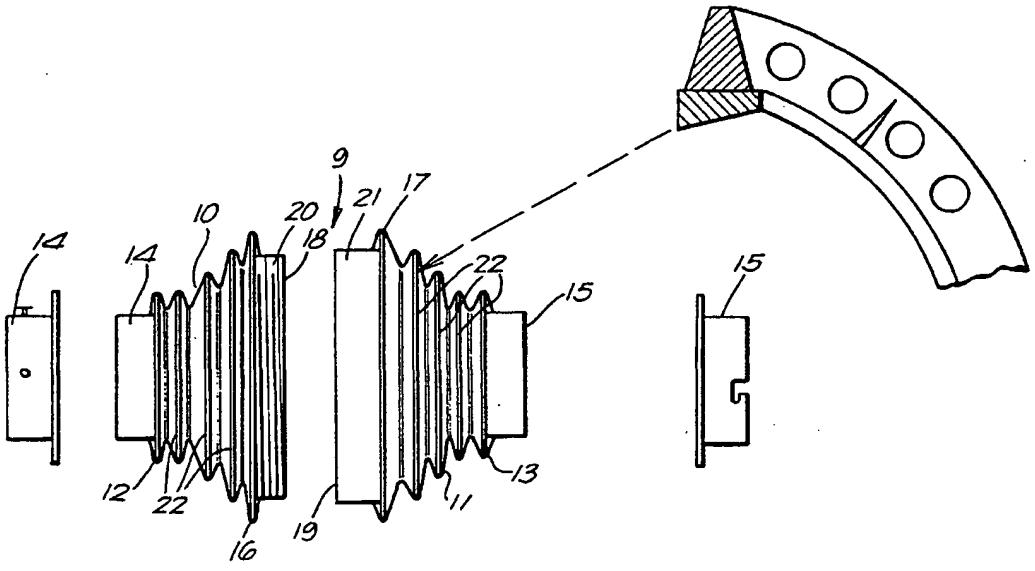

(57) Abstract

A guard attachment (1) for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement comprises: a pair of flexible hollow cone-shaped members (10, 11) each capable of axial bending but resistant to radial compression, each cone-shaped member being provided at its narrower diameter end with a first connector means (14, 15), the first connector means either (a) being adapted to connect the cone-shaped member to a housing of the prime mover or of the accessory or implement; or (b) being adapted to connect the cone-shaped member to another PTO shaft guard attachment; or (c) comprising bearing means adapted to be locatable about a PTO output/input stub of a prime mover, implement or accessory and a second connector means (18, 19) adapted to connect the cone-shaped members together at their wider diameter ends.

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GUARD ATTACHMENT FOR POWER TAKE-OFF SHAFT

Technical Field

This invention relates to a guard attachment for a power take-off shaft between a prime mover and an accessory or implement, and more particularly to a guard attachment for a power take-off shaft comprising a wide-angled joint.

Background Art

The specification of my European Patent No. 0086606 discloses a safety guard for a power take-off (PTO) shaft between a prime mover and a powered accessory or implement whose orientation with respect to the prime mover may change, the guard comprising a flexible tubular member capable of axial extension and retraction and of axial bending but resistant to radial compression, bearing means being provided within the flexible tubular member for engagement with the PTO shaft when the flexible tubular member undergoes axial bending. Coupling means are provided at each end of the flexible tubular member for attachment to housings of the prime mover and the accessory or implement.

In my European Patent Application No.92902512.0 I have disclosed a further arrangement in which a connector means for a PTO shaft guard comprises bearing means adapted to be locatable about a PTO output/input stub of a tractor, vehicle or implement. The entire disclosures

of the above European patent and application are incorporated herein by reference.

The above arrangements have been very successful in practice, but difficulties have been encountered in locating a guard around a common type of PTO shaft which is provided with a wide-angled joint (usually at the tractor end of the shaft). Such joints are relatively large in comparison to the diameter of the PTO shaft, and the extreme range of angular movement of the joint places unacceptable stresses on the guard region surrounding the joint which can lead to rupture and failure.

Disclosure of the Invention

It is an object of the present invention to provide a safety guard for a wide-angled joint on a PTO shaft located between a prime mover and a powered accessory or implement.

This object and various other useful features are achieved in accordance with the invention by the provision of a bi-conical guard attachment which can be assembled over the joint.

According to the invention there is provided a guard attachment for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement which comprises:

a pair of flexible hollow cone-shaped members each capable of axial bending but resistant to radial compression,

each cone-shaped member being provided at its narrower diameter end with a first connector means, the first connector means either

(a) being adapted to connect the cone-shaped member to a housing of the prime mover, or of the accessory or implement, or

(b) being adapted to connect the cone-shaped member to another PTO shaft guard attachment, or

(c) comprising bearing means adapted to be locatable about a PTO output/input stub of a prime mover, implement or accessory

and a second connector means adapted to connect the cone-shaped members together at their wider diameter ends.

The prime mover can be, for example, an agricultural tractor, a lorry or truck, or similar vehicle. The accessory or implement can be for example, a powered harvester, a harrow, or similar powered equipment.

The cone-shaped members, which can be the same or different, can be formed from synthetic rubber or plastics materials, and are preferably of convoluted tubular construction, for example in the form of a pair of cone-shaped bellows which are capable of axial extension and retraction.

The cone-shaped members are preferably provided with internal support means which can, for example, be bearing rings which are preferably formed from a hard plastics material. The bearing rings are preferably contoured and

diametered so that they fit into the convolutions of the cone-shaped members. The guard attachment of the invention will normally be connected at one end to another elongate PTO shaft guard attachment which extends over the remaining exposed length of the PTO shaft, and at its other end either to a housing of the prime mover, accessory or attachment, or to a bearing means adapted to be locatable about the PTO output/input stub axle of the prime mover, accessory, or attachment. The connection to the elongate PTO shaft guard attachment is preferably of the quick attachment type, that is to say, not requiring separate bolts or screws, and may comprise, for example, a screw-threaded or a bayonet-type connector with male and female connecting parts. Examples of connections to housings are shown in my European Patent No. 0086606 and of connections to a bearing means in my European Patent Application No. 92902512.0. Preferably one of the cone-shaped members is provided with a first connector means which comprises one half of a bayonet connector for connecting to a cooperating part on an elongate PTO shaft guard attachment, and the other cone-shaped member is provided with a connector means for connection to a bearing means adapted to be locatable about a PTO output/input stub of a prime mover.

The second connector means for connecting the cone-shaped members together at their wider diameter ends can be a separate part, but is preferably located on one or both of the cone-shaped members. Preferably it is of the

quick attachment type, and for example it may comprise two cooperating parts, one on each of the cone-shaped members, which can be locked together. For example, the second connector means may comprise a bayonet-type connector or any other suitable device. In a preferred arrangement, the largest bearing ring of each cone-shaped member comprises one part of a two-part connector, and for example they may have male and female sections which can be locked together.

The guard attachment of the invention is easy to fit and remove at will and comprises relatively few parts of rugged construction. It provides a simple and inexpensive means of extending the versatility of the PTO shaft guard attachment of European Patent No. 0086606.

Various embodiments of the invention will now be specifically described with reference to the accompanying Drawings in which:

Brief Description of Drawings

Figure 1 shows a view of a PTO guard attachment of European Patent 0086606 in side elevation, together with a connector means of European Patent Application No. 92902512.0;

Figure 2 shows the PTO guard attachment of Figure 1 as applied to a PTO shaft incorporating a wide-angled joint, in side elevation;

Figure 3 shows an exploded view of a first guard attachment according to the invention; and

Figure 4 shows a side elevational view of the guard attachment of Figure 3 positioned on a PTO shaft and connected to the guard attachment of Figures 1 and 2.

Detailed Description of Drawings

Referring now to Figure 1, the prior art guard attachment illustrated generally at 1 comprises an elongate flexible convoluted tubular member 2, formed from synthetic rubber, having at each end a male part of a bayonet fitting 3,4 which are attachable respectively to female connectors 5,6 comprising a bearing adapted to fit over a stub axle.

Figure 2 shows the same guard attachment positioned on a PTO shaft 7, provided with a wide-angled joint 8. It can be seen that, solely to encompass the wide-angled joint it would be necessary to use a guard attachment far larger than would be necessary for the PTO shaft alone, and that the wide-angled joint is likely to represent a stress point for the convoluted tubular member.

Figure 3 shows an exploded view of a guard attachment according to the invention. The attachment, illustrated generally at 9, comprises a pair of convoluted cone-shaped bellows 10, 11 each having five convolutions. The outermost (narrowest) convolutions 12, 13 are provided with seated flanged bayonet connectors 14, 15, which are respectively male and female. The innermost (widest) convolutions 16, 17 are provided with seated flanged bearing rings 18, 19 having cooperating

threaded portions 20, 21. The remaining convolutions are provided with seated bearing rings 22 whose cross-sectional shape is illustrated in the inset. The cross-section of the rings 22 is generally triangular in order that they can be accommodated snugly in the convolutions.

The convoluted cone-shaped bellows 10, 11 can have any suitable number of convolutions, but preferably there are at least four on each cone-shaped bellows. The number of convolutions on each bellow need not necessarily be the same, and for example left hand bellows 10 could have five convolutions and right hand bellows 11 could have six convolutions.

The cone-shaped bellows can, for example have an internal diameter of about 160mm at the narrower end and about 245mm at the wider end. The convolutions can for example have a height of about 32.5mm, measured at the longer side, and a pitch of about 20mm.

Figure 4 shows a guard attachment assembled around a wide-angled joint on a PTO shaft. In assembling the guard attachment, the bellows 11 is first slid along the shaft and mated with the bellows 10 applied from the other end, via threaded bearing rings 18, 19. The elongate guard attachment 1 is then slid over the shaft and connected to the bellows 11 by the bayonet connector 3, 15. There is thereby formed a continuous guard surface for the full length of the PTO shaft.

The reader's attention is directed to all papers and documents which are filed concurrently with this

specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps or any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

CLAIMS

1. A guard attachment for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement which comprises:

a pair of flexible hollow cone-shaped members each capable of axial bending but resistant to radial compression;

each cone-shaped member being provided at its narrower diameter end with a first connector means, the first connector means either

(a) being adapted to connect the cone-shaped member to a housing of the prime mover or of the accessory or implement, or

(b) being adapted to connect the cone-shaped member to another PTO shaft guard attachment, or

(c) comprising bearing means adapted to be locatable about a PTO output/input stub of a prime mover, implement or accessory

and a second connector means adapted to connect the cone-shaped members together at their wider diameter ends.

2. A guard attachment according to Claim 1, in which the prime mover is an agricultural tractor.

3. A guard attachment according to Claim 1 or 2, in which the cone-shaped members are of convoluted tubular construction.

4. A guard attachment according to any of the preceding claims, in which the cone-shaped members are provided with internal support means.

5. A guard attachment according to Claim 4, in which the internal support means comprises a plurality of bearing rings.

6. A guard attachment according to Claim 5, in which the bearing rings are contoured and diametered so that they fit into convolutions on the cone-shaped members.

7. A guard attachment according to any of the preceding claims, in which the first connector means comprises a male or female part of a bayonet connector.

8. A guard attachment according to any of the preceding claims, in which the second connector means comprises two cooperating parts, one on each of the cone-shaped members.

9. A guard attachment according to Claim 8, in which each of the two cooperating parts also comprises the largest bearing ring of each cone-shaped member.

10. A PTO shaft having a wide-angled joint protected by a guard attachment according to any of the preceding claims.

11. A PTO shaft according to Claim 10, that is protected by a combination of a guard attachment according to any of Claims 1 to 9 covering the wide-angled joint, and a guard attachment of uniform diameter covering the remaining length of the PTO shaft, the two guard

attachments being connected by a quick attachment type connector.

12. A guard attachment for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement, the guard attachment substantially as hereinbefore described with reference to the accompanying drawings.

13. A PTO shaft having a wide-angled joint protected by a guard attachment, substantially as hereinbefore described with reference to the accompanying drawings.

AMENDED CLAIMS

[received by the International Bureau on 23 August 1994 (23.08.94); original claim 3 cancelled; original claim 1 amended; claims 4-13 renumbered as claims 3-12; other claims unchanged (3 pages)]

1. A guard attachment for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement which comprises:

a pair of flexible hollow cone-shaped members of convoluted tubular construction, each capable of axial bending but resistant to radial compression;

each cone-shaped member being provided at its narrower diameter end with a first connector means, the first connector means either

(a) being adapted to connect the cone-shaped member to a housing of the prime mover or of the accessory or implement, or

(b) being adapted to connect the cone-shaped member to another PTO shaft guard attachment, or

(c) comprising bearing means adapted to be locatable about a PTO output/input stub of a prime mover, implement or accessory

and a second connector means adapted to connect the cone-shaped members together at their wider diameter ends.

2. A guard attachment according to Claim 1, in which the prime mover is an agricultural tractor.

3. A guard attachment according to any of the preceding claims, in which the cone-shaped members are provided with internal support means.

4. A guard attachment according to Claim 3, in which the internal support means comprises a plurality of bearing rings.

5. A guard attachment according to Claim 4, in which the bearing rings are contoured and diametered so that they fit into convolutions on the cone-shaped members.

6. A guard attachment according to any of the preceding claims, in which the first connector means comprises a male or female part of a bayonet connector.

7. A guard attachment according to any of the preceding claims, in which the second connector means comprises two cooperating parts, one on each of the cone-shaped members.

8. A guard attachment according to Claim 7, in which each of the two cooperating parts also comprises the largest bearing ring of each cone-shaped member.

9. A PTO shaft having a wide-angled joint protected by a guard attachment according to any of the preceding claims.

10. A PTO shaft according to Claim 9, that is protected by a combination of a guard attachment according to any of Claims 1 to 8 covering the wide-angled joint, and a guard attachment of uniform diameter covering the remaining length of the PTO shaft, the two guard attachments being connected by a quick attachment type connector.

11. A guard attachment for a wide-angled joint on a PTO shaft located between a prime mover and an accessory or implement, the guard attachment substantially as hereinbefore described with reference to the accompanying drawings.

12. A PTO shaft having a wide-angled joint protected by a guard attachment, substantially as hereinbefore described with reference to the accompanying drawings.

FIG. 1 (PRIOR ART)

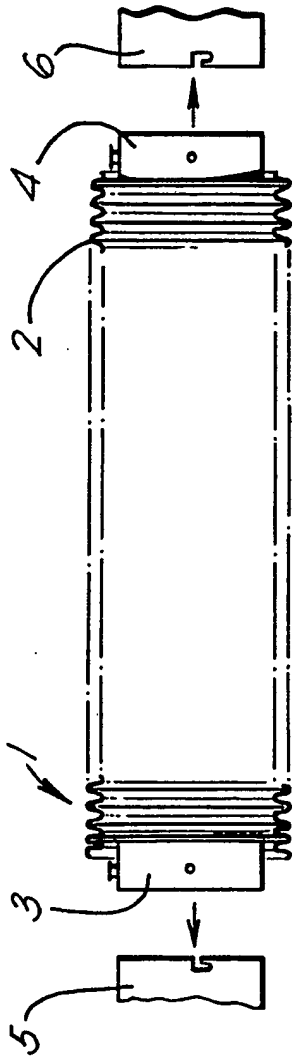
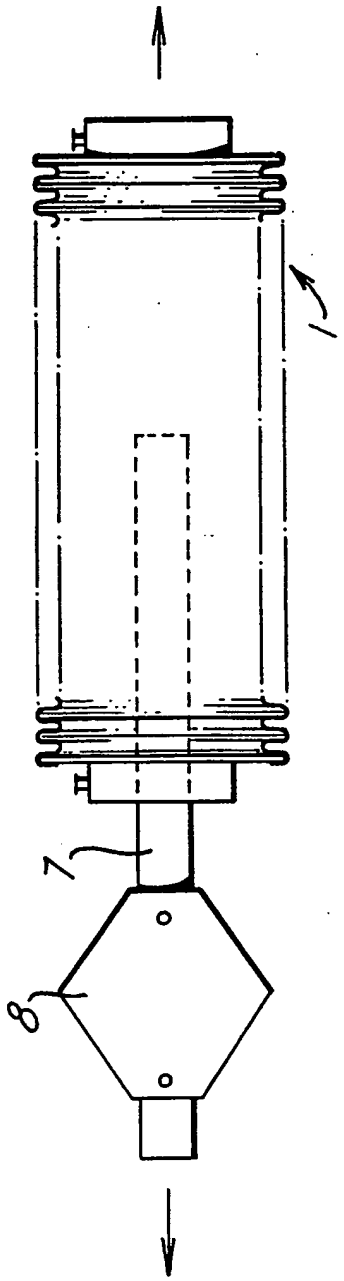


FIG. 2 (PRIOR ART)



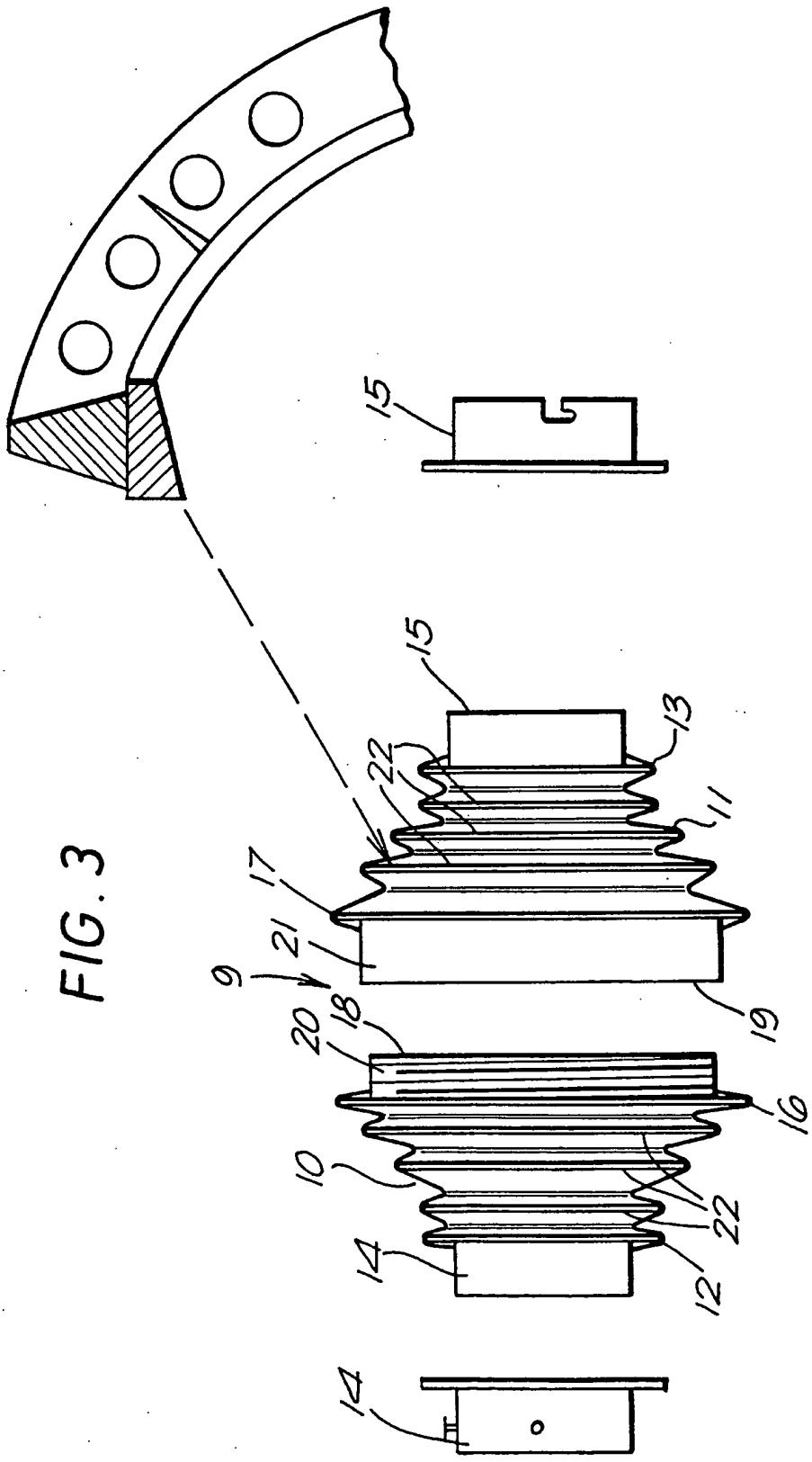
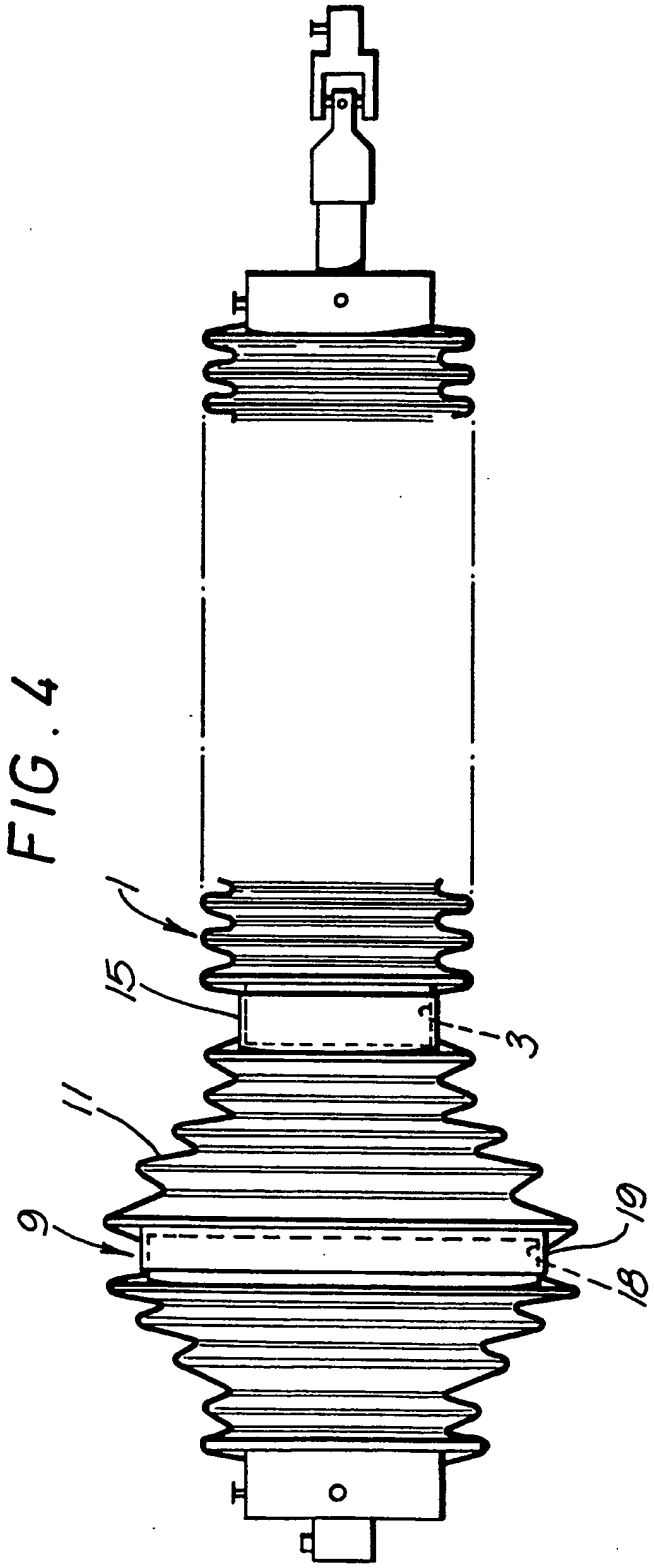


FIG. 3

FIG. 4



INTERNATIONAL SEARCH REPORT

Interna. J Application No
PCT/EP 94/00545

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A01B71/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,2 342 630 (WALTERSCHEID) 30 September 1977 see page 1, line 20 - line 30 see page 2, line 35 - page 3, line 8 see page 3, line 19 - line 28; figures	1-5,8-13
Y	---	6,7
Y	EP,A,0 086 606 (TAYLOR) 24 August 1983 cited in the application see abstract see page 3, line 16 - line 23	6
Y	---	7
	WO,A,92 09189 (TAYLOR) 11 June 1992 see abstract; figures	
X	---	1-4,8, 11-13
	FR,A,1 126 151 (PULLMAN) 16 November 1956 see the whole document	

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
FR-A-2342630	30-09-77	DE-A-	2609069	01-09-77
		AT-B-	344431	25-07-78
		AU-A-	2066876	22-06-78
		CA-A-	1032977	13-06-78
		GB-A-	1570315	25-06-80
		JP-A-	52107460	09-09-77
		SE-A-	7614431	06-09-77
		US-A-	4107952	22-08-78
EP-A-0086606	24-08-83	AU-B-	552749	19-06-86
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		US-A-	4663984	12-05-87
WO-A-9209189	11-06-92	AU-A-	8912791	25-06-92
		CA-A-	2095845	23-05-92
		EP-A-	0558678	08-09-93
		FI-A-	932319	21-05-93
		NZ-A-	240692	27-04-94
FR-A-1126151		NONE		